DOCUMENT RESUME

ED 345 797 JC 920 277

TITLE	Cardiovascular Technology Program Needs Assessment.
INSTITUTION	Oakland Community Coll., Farmington, MI. Office of Institutional Planning and Analysis.
PUB DATE	Mar 91
NOTE	51p.
PUB TYPE	Reports - Evaluative/Feasibility (142) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Allied Health Occupations Education; *Allied Health Personnel; Community Colleges; *Employer Attitudes; Employment Projections; Feasibility Studies; Job Training; *Labor Market; *Labor Needs; Needs Assessment; Occupational Surveys; Program Proposals; Questionnaires; Two Year Colleges
IDENTIFIERS	*Cardiovascular Technology

ABSTRACT

In 1990/91, a study was conducted by Oakland Community College (OCC) tc evaluate the need for a proposed Cardiovascular Technology program. Fifty-two local hospitals were surveyed to gather information on the employment demand, employment benefits and career preparation requirements for cardiovascular technologists (CVTs), yielding a 62% response rate. In addition, interviews were conducted with the directors of four existing CVT training programs in order to ascertain program costs. Study findings included the following: (1) employers were more likely to hire noninvasive CVTs than invasive CVTs; (2) 96% of the respondents indicated that they planned to hire new CVTs next year; (3) over 60% of all current CVTs would need retraining or upgrading of their skills within a year; (4) entry-level annual salaries for CVTs ranged from $18,675 to $25,846; (5) 56% of the respondents provided on-site training for CVTs, but 75% believed that current training for CVTs was inadequate; (6) more than 86% affirmed the need for a CVT program; (7) a majority of respondents were willing to allow OCC students to do on-site training for invasive (60%) and noninvasive (83%) procedures; and (8) while the estimates of costs for program start-up/first year ranged from $123,000 to $282,000, equipment costs could be reduced considerably by soliciting donations of capital equipment from hospitals or vendors. Appendixes include "Essentials and Guidelines of an Accredited Educational Program for the Cardiovascular Technologist" (initially adopted in 1985), minutes of an advisory committee meeting, the survey instruments, and lists of respondents. Includes 9 references. (JSP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED345797

CARDIOVASCULAR TECHNOLOGY PROGRAM NEEDS ASSESSMENT

prepared by:

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

M. A. Orlowski

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☒ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

The Office of Institutional Research
Oakland Community College

March 1991

JC920277

BEST COPY AVAILABLE

CARDIOVASCULAR TECHNOLOGY PROGRAM
NEEDS ASSESSMENT

CONTENTS

INTRODUCTION..... 1

Initiation..... 1

Description of Proposed Program..... 1

Description of Occupation..... 2

Relation of Proposed Program to College Mission..... 5

METHODOLOGY..... 5

Methods of Data Collection..... 5

Methods of Data Analysis..... 6

ANALYSIS..... 6

Employment..... 6

Employee Benefits..... 8

Career Preparation..... 11

Preliminary Cost Estimate..... 17

SUMMARY..... 20

TABLES

Table 1: Hospital Employment of Cardiovascular Technologists... 8

Table 2: Cardiovascular Technologists' Annual Salaries..... 9

Table 3: Cardiovascular Technologists' Advancement Opportunities.....10

Table 4: Hospital Noninvasive Skill Requirements..... 12

Table 5: Hospital Invasive Skill Requirements..... 13

Table 6: College Program Enrollment..... 16

Table 7: College Program Expenses..... 17

Table 8: College Program Expenses for Capital Equipment..... 19

INTRODUCTION

The purpose of the report is to gather and present information that will help to evaluate the need for a cardiovascular technology program at Oakland Community College, Highland Lakes Campus.

Initiation

In February 1990 Dr. James Warner, Dean of Academic Affairs (Highland Lakes), after meetings with Dee Scherer, Medical Assisting Director (Highland Lakes), proposed that Oakland Community College assess the need to develop a cardiovascular technology program as an option within the existing Medical Assisting program.

The results of a preliminary study indicated the following reasons for offering a program in cardiovascular technology:

1. Employers indicated the need for an accredited program for training cardiovascular technologists.
2. The field of cardiovascular technology continues to grow and become more complex.
3. The number of school-trained technologists is inadequate to meet the needs of the field.
4. Hospitals no longer have time, nor funds for teaching the entire range of cardiovascular techniques.
5. The proposed program could provide a base where students could prepare for required registry examinations.

Description of Proposed Program

The proposed cardiovascular program would include training both in noninvasive and invasive cardiovascular technology procedures (See APPENDIX A). Initial plans are to enroll students for the noninvasive cardiovascular track in the Fall 1991 semester (See separate document: Noninvasive Cardiovascular Technology Program). Eventually the program would also include the invasive cardiovascular track (tentative date, Fall 1993), and subsequently noninvasive peripheral vascular studies. The program would conform to the minimum standards for accrediting educational programs for cardiovascular technologists (CVTs) that the Committee on Allied Health Education and Accreditation (CAHEA) developed (See APPENDIX A).

Affiliations with local hospitals will provide on-site learning experiences. Observations through clinical work will begin at the end of the first year of course work as recommended by the cardiovascular technology advisory committee (See APPENDIX B). During the second year of course work students will spend required hours at a clinical site.

Description of Occupation

Although cardiovascular technologists have functioned in clinical settings since the mid-1950s only recently have they agreed upon a description of their field. In 1985 thirteen medical and professional organizations agreed upon a description of cardiovascular technology:

> Cardiovascular technology is an allied health profession specifically concerning the diagnosis and treatment of patients with heart and peripheral vascular disease. The technologist performs examinations at the request or direction of a physician. The technologist is proficient in the use of analytical equipment and sundry apparatus including placing such equipment on or into the patient or placing the patient on the equipment. It is not the intent that the cardiovascular technologist be trained to expose patients to ionizing radiation. Through subjective sampling and/or recording, the technologist proceeds with the examination to create an easily definable foundation of data from which a correct anatomic and physiologic diagnosis may be established for each patient.
>
> The profession of cardiovascular technology encompasses the three areas of diagnostic evaluation:
>
> 1) invasive cardiology;
> 2) noninvasive cardiology; and
> 3) noninvasive peripheral vascular study.
>
> Expertise in one area does not imply expertise in other areas. The procedures performed by the cardiovascular technologist may be found in, but are not limited to, one of the following general settings:
>
> 1. Invasive cardiovascular laboratories, including cardiac catheterization, blood gas and electrophysiology laboratories.
>
> 2. Noninvasive cardiovascular laboratories including echocardiography, exercise stress test and electrocardiography laboratories.

3. Noninvasive peripheral vascular studies laboratories including Doppler ultrasound, thermography and plethysmography laboratories. (CAHEA, 1-2; Appendix A)

The cardiovascular field has grown rapidly. According to Carney (November-December 1988, 468) the demand for qualified cardiovascular technologists has increased at an "alarming" rate and employers cannot find enough graduates skilled as cardiovascular technologists. The Occupational Outlook Handbook (1988-89) confirms the increased demand for cardiovascular technologists skilled in newly developed procedures, and presents reasons for considering the development of new training programs:

> Cardiology is one of the most rapidly developing fields in medicine today, and new procedures for diagnosing and treating heart and circulatory problems are being introduced all the time. These have raised skill requirements and created new occupations in the areas of cardiovascular and cardiopulmonary technology.

As demands for new procedures continue to surface the medical profession continues to develop and refine the parameters of cardiovascular technology. For example, Cardiovascular Credentialing International (CCI) mailed surveys in January 1990 to 3,200 cardiovascular technicians/technologists to determine the current actual duties of invasive and noninvasive cardiovascular technologists. According to the results of the survey, CCI will update its test specifications for the Cardiovascular Technology Registry Examination.

The establishment of cardiovascular programs has not kept pace with the demand for cardiovascular technologists. The availability of only two approved cardiovascular programs and two accredited cardiovascular programs in the United States limits opportunities for students to enroll in a comprehensive cardiovascular technology program. Most cardiovascular technologists have received their training at hospitals (Reiling, Parrish and Fogel, 1990).

Approving and accrediting agencies have been active only during the last six years. The National Society for Cardiovascular Technology/National Society for Pulmonary Technology (NSCT/NSPT) approved the cardiovascular program at Gwynedd-Mercy College (Gwynedd Valley, Pennsylvania) in 1985, and the cardiovascular program at State University of New York at Stony Brook (Stony Brook, New York) in 1986.

CAHEA began granting accreditations even more recently than the NSCT/NSPT granting of approvals. In just one year, 1989, CAHEA accredited two cardiovascular programs. One, a program with three specialties (invasive cardiology, noninvasive cardiology, and noninvasive peripheral vascular studies) at Grossmont Community College (San Diego, California), and the other, a program with two specialties (invasive cardiology and noninvasive cardiology) at Spokane Community College (Spokane, Washington). Both programs received five-year accreditations (Gallagher Loya 1990). The recency of approved and accredited programs testify to the growth of the field.

Another reflection of rapid growth in the field of cardiovascular technology is that recently developed approval and accreditation procedures continue to change. The NSCT/NSPT is devising shortened procedures for NSCT/NSPT approved programs to gain CAHEA accreditation. NSCT/NSPT will also send out an extensive survey in March, 1991 to help in a reassessment of the organization's requirements for approval (McElgunn, NSCT/NSPT). CAHEA is also revising its current requirements for accreditation (Allied Health Education Newsletter, 1990).

Still an additional indicator of rapid growth in the field is that recently approved programs are already reassessing the importance of accreditation. The approval criteria of NSCT/NSPT are less stringent and the process less expensive than the accreditation process of CAHEA (McElgunn, NSCT/NSPT, 1991). Nonetheless both of the NSCT/NSPT approved colleges are preparing for CAHEA accreditation.

The wide variety of credentials available also attests to the expansion of skill requirements and expertise needed to keep pace with technology developments in the field. The recently available results of the CCI survey also reveal credential requirements for employment of invasive CVTs. Of the invasive CVTs surveyed 67 percent hold credentials. These CVTs claimed at least 10 different varieties of credentials. The CCI survey cites both the high percentage of credentialed CVTs and the variation in credentials as evidence of an increased emphasis on credentials by CVT employers and an interest in continuing education by CVT employees.

Hospital-related organizations are just beginning to gather information on salaries of cardiovascular technologists. According to the CCI survey, invasive CVTs in Michigan receive an average annual salary of $35,568. The invasive CVT salaries range from $25,376 to $45,760. The CCI survey data for salaries offered to noninvasive CVTs is not yet available.

In sum, the occupation of cardiovascular technologist has experienced rapid grow since its origin in the 1950s and approving, accrediting and credentialing agencies are scrambling to reassess and update their requirements in view of new developments and procedures in the field.

Relation of Proposed Program to College Mission

The present investigation focuses on the need for developing a cardiovascular technology program in accord with the mission of the college, which aims to meet the "...needs of the communities it serves within the human and physical resources available". The study aims to discover the employment needs, benefits to the employee, the employers' expectations of a cardiovascular program, and general cost estimates of resources needed for the establishment of the program.

METHODOLOGY

Due to the newness of the field and its continuing rapid growth the medical field has only recently begun to identify cardiovascular technology and define its parameters. Consequently, information about employment potentials and career preparation for cardiovascular technologists is either sparse or nonexistent. Thus, surveys, devised to assess the need for a cardiovascular technology program, were designed to address these issues.

Methods of Data Collection

In order to determine particulars about the potential need of a cardiovascular program in the community and how the college could identify and meet the demands of such a program, survey questionnaires (See APPENDIX D) were sent to fifty-two local hospitals that employ cardiovascular technologists (See APPENDIX E). The survey addressed three areas, namely:

1. employment demands
2. employment benefits, and
3. career preparation

Survey questions about employment demands included inquiries about current employment of invasive and noninvasive cardiovascular technologists, and future employment needs, such as needs for retraining current employees. Survey questions concerning employment benefits included inquiries about salary levels, advancement opportunities, and other reasons for choosing cardiovascular technology as a career. Finaly survey questions

focusing on career preparation included requests for identifying needed skills and credentials, comments on the adequacy of currently available training, and assurances about the availability of training on the hospital site for potential Oakland Community College students.

By means of an interview process, a second survey (See APPENDIX F) addressed questions concerning possible program costs to program directors in two NSCT/NSPT approved colleges and two CAHEA accredited colleges (See APPENDIX G).

In Michigan, however, only two colleges offer cardiovascular technology programs, namely, Marygrove College and Carnegie Institute. CAHEA has not accredited the programs and the NSCT/NSPT has not approved them. Employers consider the number of programs offered in Michigan inadequate to meet existing needs (See Analysis section).

Methods of Data Analysis

Thirty-two of the 52 hospitals surveyed (62%) responded. Data were analyzed by means of frequency distributions and content analysis of narrative responses.

ANALYSIS

Employment

Because the Michigan Occupational Information System (MOIS) and the Michigan Employment Security Commission (MESC) in their Dictionary of Occupational Titles (D.O.T.) have no formal "cardiovascular technologists" classification, they therefore have no employment data for cardiovascular technologists, whether invasive or noninvasive.

MOIS has a "cardiologists" classification but this refers only to physicians. However, because of the rapid growth in the field MESC is currently investigating the possibility of including "cardiovascular technologists" in their classifications (Dunham, 1991).

Hospital employers surveyed, however, recognize cardiovascular technologists and provided information regarding current employment, future employment, and advancement opportunities in the field.

Employers indicated that they are currently more likely to hire noninvasive cardiovascular technologists than invasive cardiovascular technologists. Over two-thirds of the respondents (68%), hire full-time invasive technologists, and fewer than one-sixth (13%) of the respondents hire part-time invasive technologists. However, over nine-tenths of the respondents (92%) hire full-time noninvasive technologists and over two-fifths (44%) of the respondents hire part-time noninvasive technologists. Thus, if this hiring pattern continues, hospitals are likely to have more openings for noninvasive CVTs than for invasive CVTs.

Employers expect continued growth in the cardiovascular field. Nearly all the hospitals (96%) indicated that they will hire new cardiovascular technologists next year (48 new CVTs altogether). Although employers indicated an inability to predict employment numbers further into the future they also perceived that they will need additional CVTs in 1995 and 2000.

Contributing to future employment picture are replacement and retraining needs. Eighty percent of hospitals project a need to replace seventy-one or more cardiovascular technologists because of retirement, attrition, etc, by 1995. On an annual basis 68 percent of hospitals acknowledged they will need to retrain 50 percent or more of their CVT staff. And of all the hospitals surveyed slightly over 60 percent of all current CVTs will need retraining or upgrading of their skills within a year.

Corresponding with the perceived need to hire new CVTs and retrain current employees, respondents expect the field of cardiovascular technology to expand during the next five to ten years. They offer the following reasons for the expansion:

- Because of an aging population and increase in heart disease, hospitals are experiencing an increase in volume of patients and workload, and are expanding and increasing their services (22 hospital respondents),

- Improved techniques in the Cath lab and in areas such as echocardiography demand more skilled people (12 hospital respondents),

- Need for replacing an aging population of current workers and for replacing Registered Nurses (RNs) and Registered Technologists (RRTs) as they leave with Cardiovascular Technologists (2 hospital respondents), and

- Historically, growth is 100% every 2 1/2 years (1 hospital respondent).

In sum, current and anticipated hiring practices reflect the growth of the field. Table I summarizes current and future employment of CVTs. Particularly significant is that more hospitals are currently hiring full-time noninvasive cardiovascular technologists (92%) than full-time invasive technologists (68%). Thus, potential employment opportunities for first and second year CVT graduates of OCC would be greater.

Table 1: Hospital Employment of Cardiovascular Technologists

CURRENT EMPLOYMENT	PERCENTAGE OF HOSPITALS
Full-time invasive CVTs	68
Part-time invasive CVTs	14
Full-time noninvasive CVTs	92
Part-time noninvasive CVTs	44
FUTURE EMPLOYMENT	
Hire new CVTs in 1991	96
Replace CVTs by 1995	80
Retrain 50% or more of CVTs	68
Retrain 60% or more of CVTs	100

Employment Benefits

Survey respondents also provided information regarding employment benefits, such as salary, working conditions, and advancement opportunities.

Table 2 illustrates the ranges in annual salaries that area hospitals presently offer to registered and non-registered CVTs.

Table 2: Cardiovascular Technologists' Annual Salaries

	ANNUAL SALARY	
	LOW	HIGH
ENTRY LEVEL		
Non-Registered	$18,675	$23,174
Registered	20,729	25,846
UPPER LEVEL		
Non-Registered	22,531	28,458
Registered	25,924	32,272

The salary range from entry level (non-registered) to upper level (registered), $18,675 to $32,272, shows that CVTs have much room for economic advancement within their field. These figures are comparable with advisory committee estimate of salaries from $30,000 to $35,000 for registered cardiovascular technologists (See Appendix B) and the CCI survey results that salaries range from $25,376 to $45,760 for invasive cardiovascular technologists in Michigan (See Introduction section).

Hospital employers classify CVT employees in different ways, e.g., specialty area, years of experience, and registered/non-registered status. Although all of them do not yet make a distinction for registered and certified statuses, they expect that this will change.

The survey requested that respondents identify titles of positions that present advancement opportunities for cardiovascular technologists. The position titles appear to fall into three categories, namely, general, specialized (invasive and noninvasive), and management (See Table 3).

Table 3: Cardiovascular Technologists' Advancement Opportunities

GENERAL	SPECIALIZED	MANAGEMENT
CVT I	Noninvasive	Chief Tech/Staff
CVT II	EKG Tech	Cath Lab Tech Leader
Senior CVT	Stress Tech	Cath Lab Supervisor
	DCG & Holter	Cath Lab Manager
	Sonographer	Director
	Senior Sonographer	Technical Coordinator
	Cardiac Ultrasound	Supervisor
	Invasive	Invasive Cardiology
	Cardiac Cath Lab	Noninvasive Cardiology
	Diagnostic Cath	Administrative Director
	Invasive CVT	

Respondents identified varied additional education and experience required for these positions. They include the following:

- on the job training
- specialized training in vascular studies
- vascular ultrasound experience/training
- Allied Health Education
- training in color flow
- catheterization education
- management classes
- college credits
- bachelors degree
- registry
- credentialing
- echocardiology experience
- lab experience
- experience as leader and supervisor

Survey responders explained why the position of cardiovascular technologist would be a desirable occupation. According to frequency of mention, a career in cardiovascular technology provides the following benefits:

- Career mobility/preparation for other career opportunities, e.g., nursing (7)
- A well-paying career after only two years of education (7)
- Opportunities for learning new technology as research in the field continues (6)
- Opportunities to help people, service a need (6)
- An interesting, exciting, dynamic, young field (5)
- An always expanding, innovative field (5)

- Choices in work setting/good environment (2)
- A marketable profession as demands increase (2)
- Job security (2)
- A challenging, competitive field (1)

Opportunities in cardiovascular technology are open to special groups. More than half of respondents (52%) declared they make special efforts to recruit minorities. And more than eight of ten hospital responders (84%) indicated they open opportunities for cardiovascular technology positions to the disabled. Those who disagreed either explained their position or qualified their responses. They perceived that the disabled could not do the following:

- push large machines
- function in Echo, Holter, and Cath Lab procedures
- position patients and help them ambulate, and
- overcome barriers and cath lab heights (e.g., a wheelchair bound person).

In sum, benefits of CVT employment afford a well-paying career with opportunities to learn new technology, to serve people in a growing profession, and to advance in various general, specialized and management areas.

Career Preparation

Survey respondents shared information regarding the general need for a program in cardiovascular technology, e.g. level of training needed, training opportunities currently available, and the social utility of developing a program in cardiovascular technology.

Nearly two-thirds of the hospitals (64%) require CVTs to hold credentials. Hospitals require the following credentials:

- Registered Cardiovascular Technologist (noninvasive) status (40%)
- Cardiographic Technician (CCT) status (36%)
- Associates Degree in Cardiovascular Technology (36%)
- Registered Cardiovascular Technologist (Invasive) status (28%)
- Holter Monitoring (28%)
- other credentials (32%)

Other credentials required by hospitals include American College of Life Support (ACLS), Stress Testing, Registry for Echo, Registry plus ACLS (for Cath), Bachelor of Science Degree, Associate Degree (Registered Technologist), Registered Nurse, RRT, and Noninvasive and EKG certification.

Employers identified skills needed in both the noninvasive and invasive areas. In the noninvasive area, well over three-fourths of the hospitals affirm the need for skills in echocardiography stress testing, electrocardiography lab procedures and Doppler Cardiac Ultrasound. And nearly half of the hospitals pointed to other noninvasive skill needs (See Table 4). The variety of skills in the "Other" category reflects parameters of the field not yet resolved.

Table 4: Hospital Noninvasive Skill Requirements

NONINVASIVE SKILLS	PERCENTAGE
Stress testing	89
Echocardiography	85
Electrocardiography lab procedures	85
Doppler Cardiac Ultrasound	78
Other	48
Electroencephalography (EEG)	
Echocardiography specialist	
Cardiovascular tech: Exercise stress testing(EXT), Holter monitoring (DCG), Electrocardiograms (ECG)	
Peripheral vascular skills in carotid (venous & arterial)	
Peripheral vascular studies	
Electrocardiography labs, EKG techs	
Holter (DCG), stress tests, pacemaker checks	
Vascular duplex/vascular	
Color flow	
Evoked Potential Laboratory	

In the invasive area more than four-fifths of the hospitals want invasive people skilled in cardiac catheterization, more than half the hospitals want people skilled in electrophysiology lab procedures, and about one-third of the hospitals (33%) want people skilled in blood gas procedures. Over one-third of the hospitals (38%) required other invasive skills. Again, the variety of skills listed in the "Other" category indicate the continuing growth of cardiovascular technology and the continuing need to define the extent of the field (See Table 5).

Table 5: Hospital Invasive Skill Requirements

INVASIVE SKILLS	PERCENTAGE
Cardiac catheterization	86%
Electrophysiology lab procedures	52%
Blood gas procedures	33%
Other	38%
Transesophageal echocardiography	
Hemodynamic monitoring/Holter and bedside monitoring	
Pacemaker	
Permanent pacemaker	
Temporary pacemaker	
Right and left heart catheterizations	
Scrub skill	
CV pharmacology	
Advanced life support	
IVs	
ACLS	
Balloon pump	
Nursing skills	
Working knowledge of radiology	
Digital radiograph skills	
Heart/pulmonary assist	
PTCA Lab	
Cardiovascular monitoring	
ACLS sterile technique	

Fifty-six percent of hospital respondents presently have on-site training for cardiovascular technologists. Of these respondents 77 percent teach basic skills, and 85 percent have programs for upgrading CVT skills.

However, three out of four hospitals (75%) state that current available training for cardiovascular technologists is inadequate. Respondents' explanations for the lack of adequate training are the following:

"Educational programs have been limited."

"Technicians constantly require further education"

"...we typically have to train our techs - most have been paramedics (cath lab only)"

"...need day and evening programs presented in a continuing education format"

"...program space is limited at institutions that offer a two year program"

"...on the job training and experience is not always adequate"

"No, not enough accredited schools. Not enough schools period."

"No, not enough formal training to prepare for registry, certification - which is being required for hire."

"Marygrove is good, not enough graduates."

"No, not enough students choosing invasive side of cardiology."

"No, need more hands on/patient experience."

"No, there are not enough programs for Cardiovascular techs or EEG techs."

"No, very difficult to find well trained Echo techs."

"No, not in Michigan area. Have had difficulty finding trained technicians."

"No, nothing out there, no schools. (Aware of Marygrove). Nice to affiliate with schools."

"No, there are limited programs available, we need more programs in the northern suburbs."

"No, need low cost classes in basics and advanced categories; especially during evening hours, clinical experience is inadequate especially for cath and echo."

"No, need a 'structured' approach with required classes, etc."

"No, not enough formal training available."

"No, education requires updating to the current trends."

More than 86 percent of respondents commented on the need for a Cardiovascular Technology program. No one denied the need for developing a new program. Comments addressed their reasons for desiring a program, and their expectations of the program. A summary of their comments follows:

<u>Rationale for the program</u>
- a current shortage of CVTs
- cost effective for hospitals

- growth expected in invasive cardiology and in Echocardiography (noninvasive),e.g., one respondent has already experienced an 80 percent recent growth in Cath Lab (invasive) and Doppler studies of patients (noninvasive)
- the importance of testing, and meeting the demands of physicians
- the desire to hire credentialed candidates

Program expectations

- a quality program, thus a good source for job placements
- academic background
- clinical rotations, so students can learn different hospital operations and procedures
- help for technicians to pass registry exams
- basic and advanced class offerings in the evening
- teaching of diagnostic skills
- a background in theory and practice
- teaching of electrophysiology
- correlation with other programs, e.g., the American College of Sports Medicine (ASCM), or the American Association of Cardiovascular and Pulmonary Rehabilitation (ACCVPR).

Educational opportunities that measure up to program expectations are almost nonexistent. The degree of expertise needed makes it impractical for hospitals to do all the training necessary. Although colleges have struggled to develop programs in the cardiovascular field over the last two or three decades, only recently has the medical profession made guidelines for approving quality programs. Only four colleges in the nation have thus far received approval for a quality program from either CAHEA or the NSCT/NSPT (See Table 6). Since these colleges are located either on the West coast (California and Washington) or near the East coast (New York and Pennsylvania), their services would not be readily available to Oakland County residents.

Two local educational institutions offer programs (Marygrove College and Carnegie Institute), but they appear inadequate to meet the needs of Oakland County area hospitals (See again Appendix B; also, Separate Document: Noninvasive Cardiovascular Technology Program).

Table 6: College Program Enrollment

	Grossmont CA	Spokane WA	Gwynedd Mercy PA	Stonybrook NY
Date established	1972	1960	1965	1970
Enrollment				
Fall 1990	59		16	
Fall 1989	52		22	
Fall 1988			21	
Fall 1987			20	
Fall 1986			25	
Dropout rate	12-15%	30%	50%	
Graduates				
Per year ave.	50	25	10	22
89-90				
88-89	46			
87-88	60			
86-87				
85-86				
Faculty				
Full-time	4	2	2	2
Part-time	6	2	1	0
Accreditation Agency	CAHEA	CAHEA	NSCT/NSPT	NSCT/NSPT
Accreditation Date	1989	1989	1985	1986

Source: College Program Directors

Area hospitals have offered support to potential CVT students at OCC. Sixty percent of responding hospitals are willing to have OCC students do on-site training for invasive CVT procedures; and 83 percent of respondents are willing to have OCC students do on-site training for noninvasive CVT procedures. The Cardiovascular Technology Program Advisory Committee (January 9, 1991) also attested to the availability of clinical sites for training of OCC students.

In sum, hospital respondents have strongly affirmed the desirability of a cardiovascular program at OCC, and have articulated ways that the program can meet their needs. In addition, they have expressed a willingness to promote the program by providing on-site training for OCC students.

Preliminary Cost Estimate

In a second survey the four colleges already operating an approved or accredited cardiovascular technology program offered estimates of costs for the first-year. These estimates ranged from $123,000 to $282,000 (See Table 7).

Table 7: College Program Expenses

	Grossmont CA	Spokane WA	Gwynedd Mercy PA	Stonybrook NY
FT instructors	$144,000	$ 55,000	$ 57,000	$105,000
PT instructors	15,000	11,000	10,000	------
Clinical facil.	------	200	-----	------
Supplies	10,000	700	3,000	4,000
Equipment	------	50,000	200,000	
Repair	3,600	1,000	1,200	
Supervision	2,000	500	800	
Cont. educ.	2,000	1,000	500	
Films	5,000	1,000	10,000	
Videotapes				
Other:				
Radiation dosimetry			200	
Radiation badges		400		
Printing		500		
Medical Dir.		2,000		
Reaccredit.		300		
Applic. site visitation	1,500			
Indiv. tutoring	3,800			
Equip. rental	600			
Totals	$187,500	$123,000	$282,700	$109,000

Source: College Program Directors

Capital expenditures varied greatly depending upon the extent of the program and whether or not hospitals or vendors donated new and/or used equipment (See Table 8). Leasing is also an option but also expensive. For example, the cost of a 5-year lease of an Echocardiograph machine ($70,000 new) is $1,500 per month, or $18,000 per year ($90,000 in five years). For shorter leases rates are even higher (Hewlett-Packard). Thus, if OCC can solicit successfully donations of capital equipment from hospitals and from companies that sell this equipment costs of the program can be reduced considerably.

Table 8: College Program Expenses for Capital Equipment

GROSSMONT COLLEGE:		
6 ECHO ($80,000 - $120,000 ea)	$480,000 - $960,000	
EKG Machines	10,000	10,000
Physiol. recorder & transducer	80,000	80,000
Oscilloscopes	400 -	800
Total	$570,000	$1,050,800
GWYNEDD-MERCY COLLEGE:		
Echocardiograph machine (1-2 needed)	$ 80,000 -	$100,000
Transducer (1)	53,000	53,000
Treadmill		
EKG Machine (2 @ $1,800 ea)	3,600	3,600
Monitor for stress testing	15,000	15,000
Anatomical simulators	10,000	10,000
Total	$161,600 -	$181,600
SPOKANE COMMUNITY COLLEGE:		
Echocardiograph machines (2) new, donated by companies		
Echocardiograph machines (5) old, donated by hospitals		
EKG Machines		
Simulators		
Calibrating equipment		
Recording equipment, invasive (1st 5 years, $10,000 per year)	$50,000	
Total	$50,000	
STATE UNIVERSITY OF NEW YORK AT STONYBROOK:		
Noninvasive equipment, estimate	$150,000	
Invasive equipment, estimate	$300,000	
Total	$450,000	

Source: College Program Directors

In sum, it seems more feasible to purchase equipment than to lease it. Companies have donated new equipment, and hospitals have donated used equipment to colleges with cardiovascular programs.

SUMMARY

The field of cardiovascular technology is growing rapidly, but programs haven't kept pace with the need for cardiovascular technologists. Hospitals affirm the need to hire new CVTs and to retrain existing technicians, both now and in the future. Benefits are multiple, including opportunities for employment and advancement in service to area communities. The consensus is that a program is needed in this region. Area hospitals have offered support by acting in an advisory capacity, donating equipment and expressing willingness to provide on-site training for OCC students.

Expenses can be great for capital equipment and repairs. Leasing can be a feasible option, but costs of purchases and/or leasing can be minimal if hospitals and vendors donate equipment.

APPENDIX A: Essentials and Guidelines

Essentials and Guidelines of an Accredited Educational Program for the Cardiovascular Technologist

Essentials initially adopted 1985

Adopted by the

AMERICAN CARDIOLOGY TECHNOLOGISTS ASSOCIATION
AMERICAN COLLEGE OF CARDIOLOGY
AMERICAN COLLEGE OF CHEST PHYSICIANS
AMERICAN COLLEGE OF RADIOLOGY
AMERICAN INSTITUTE OF ULTRASOUND IN MEDICINE
AMERICAN MEDICAL ASSOCIATION
AMERICAN SOCIETY OF ECHOCARDIOGRAPHY
NATIONAL ALLIANCE OF CARDIOVASCULAR TECHNOLOGISTS
NATIONAL SOCIETY FOR CARDIOPULMONARY TECHNOLOGY
SOCIETY OF DIAGNOSTIC MEDICAL SONOGRAPHERS
SOCIETY OF NON-INVASIVE VASCULAR TECHNOLOGY
SOCIETY FOR VASCULAR SURGERY/INTERNATIONAL SOCIETY FOR CARDIOVASCULAR SURGERY

Program Review Committee
JOINT REVIEW COMMITTEE ON EDUCATION IN CARDIOVASCULAR TECHNOLOGY

Essentials are the minimum standards for accrediting educational programs that prepare individuals to enter an allied health profession recognized by the American Medical Association. The extent to which a program complies with these standards determines its accreditation status; the **Essentials** therefore include all requirements for which an accredited program is held accountable. **Essentials** are printed in regular typeface in outline form.

Guidelines assist programs in complying with the **Essentials** by providing examples of how general statements in **Essentials** may be interpreted. *Guidelines* are printed in italic typeface in narrative form.

PREAMBLE

OBJECTIVES

The American Cardiology Technologists Association, American College of Cardiology, American College of Chest Physicians, American College of Radiology, American Institute of Ultrasound in Medicine, American Medical Association, American Society of Echocardiography, National Alliance of Cardiovascular Technologists, National Society for Cardiopulmonary Technology, Society of Diagnostic Medical Sonographers, Society of Non-Invasive Vascular Technology, and the Society for Vascular Surgery/International Society for Cardiovascular Surgery cooperate to establish, maintain and promote appropriate standards of quality for educational programs for the cardiovascular technologist, and to provide recognition for educational programs which meet or exceed the minimum standards outlined in these *Essentials*.

These standards are to be used for the development and self evaluation of allied health educational programs. Site-visiting teams assist in the evaluation of the program's compliance with the *Essentials*. Lists of accredited programs are published for the information of students, employers, and the public.

DESCRIPTION OF THE PROFESSION

Cardiovascular technology is an allied health profession specifically concerning the diagnosis and treatment of patients with cardiac and peripheral vascular disease. The technologist performs examinations at the request or direction of a physician. The technologist is proficient in the use of analyti-

BEST COPY AVAILABLE

cal equipment and sundry apparatus including placing such equipment on or into the patient or placing the patient on the equipment. It is not the intent that the cardiovascular technologist be trained to expose patients to ionizing radiation. Through subjective sampling and/or recording, the technologist proceeds with the examination to create an easily definable foundation of data from which a correct anatomic and physiologic diagnosis may be established for each patient.

The profession of cardiovascular technology encompasses the three areas of diagnostic evaluation: 1) invasive cardiology; 2) noninvasive cardiology; and 3) noninvasive peripheral vascular study.

Expertise in one area does not imply expertise in other areas.

The procedures performed by the cardiovascular technologist may be found in, but are not limited to, one of the following general settings:

1. Invasive cardiovascular laboratories, including cardiac catheterization, blood gas and electrophysiology laboratories.
2. Noninvasive cardiovascular laboratories including echocardiography, exercise stress test and electrocardiography laboratories.
3. Noninvasive peripheral vascular studies laboratories including Doppler ultrasound, thermography and plethysmography laboratories.

REQUIREMENTS FOR ACCREDITATION

I. SCOPE OF ACCREDITATION

A. Cardiovascular technology educational programs will encompass one or more of the three basic areas of expertise: invasive cardiology, noninvasive cardiology, or noninvasive peripheral vascular study.

B Applicants for accreditation of cardiovascular technology programs must specify the area or areas of specialization for which accreditation is being sought. Accreditation in one area does not imply accreditation in other areas. Lists of accredited programs must indicate the specific areas for which accreditation has been granted.

II. SPONSORSHIP

A. The sponsoring institution and affiliates, if any, must be accredited by recognized agencies or meet equivalent standards.

B. Accredited educational programs may be established in:
   1. Community and junior colleges, senior colleges and universities.
   2. Hospitals and clinics.
   3. Medical schools.
   4. Postsecondary vocational/technical schools and institutions.
   5. Other acceptable institutions which meet comparable standards for education in this field.

Acceptable "postsecondary vocational/technical schools and institutions" include vocational or technical schools accredited by regional accrediting associations or by other comparable and appropriate accrediting agencies. Institutional accreditation establishes evidence that the program sponsor meets recognized professional standards for its primary mission. This same evidence should also be the basis for determining whether or not an institution meets "comparable standards."

Sponsoring institutions utilizing clinical education centers are expected to insure that these health care facilities are comparably and appropriately accredited. These centers should have such facilities as a peripheral vascular studies laboratory, a noninvasive cardiology laboratory, cardiac catheterization laboratory, an open heart surgery program, an emergency room as well as critical care facilities.

C. In programs where the academic and clinical education are provided by two or more institutions, accreditation is granted to the institution that assumes primary responsibility for curriculum planning and selection of course content; coordinates classroom teaching and supervised clinical education; appoints faculty to the program; receives and processes applications for admission; and grants the degree or certificate documenting completion of the program. The sponsoring institution shall also be responsible for assuring that activities assigned to students in the clinical setting are educational.

Sponsoring institutions are expected to demonstrate accountability to the public, students and the medical profession for an effective, valid, and legitimate educational process. Sponsoring institutions should indicate on the degree or certificate the area or areas of expertise acquired.

D. Responsibilities of the sponsor and each affiliate must be clearly described in written documents, such as affiliation agreements.

A written affiliation agreement should be signed by the appropriate institutional officers, and clearly delineate the responsibilities of students and of each institution with regard to student supervision, benefits, liability and financial arrangements, if any. Each institution should retain a copy of the written agreement.

III. RESOURCES

A. General Resources
   Resources must be adequate to support the number of students who are admitted to the program. The instructor/student ratio shall be adequate to achieve the stated objectives of the curriculum.

Clinical training should, wherever possible, be on a one-to-one ratio. Clinical faculty should be responsible for scheduling, supervising and testing of no more than ten (10) students per instructor per course of instruction.

B. Personnel
   1. Program Officials
      The program must have at least two qualified program officials—a program director and a medical director. In accordance with institutional policies and practices, these officials shall possess the qualifications and assume the responsibilities described below.
      a. Program Director
         i. Responsibilities
            The program director's duties include the organization, administration, periodic review, continued development and general effectiveness of the program. The program director shall provide supervision, administration and coordination of the instructional staff in the academic and clinical phases of the educational program.

The program director has responsibility for the daily operation of the program as well as assessing its appropriateness in terms of education, operating structure and incorporating new concepts and techniques. In addition, this person is responsible for

maintaining the quality of the program.

ii. Qualifications
The program director must be a qualified faculty member and possess a higher level of education and/or professional experience than that for which the students in the program are being prepared.

A qualified program director should possess the necessary academic prerequisites and clinical experience in cardiovascular technology that are in accordance with the normal requirements for faculty members of the sponsoring institution.

b. Medical Director
i. Responsibilities
The medical director of the program shall provide competent medical guidance to ensure that the medical component of the curriculum, both didactic and supervised practice, meets current acceptable standards.
ii. Qualifications
The medical director must be a currently licensed physician who is experienced in the diagnosis of cardiac and/or vascular disease and must be knowledgeable and effective in teaching the subjects assigned.

2. Instructional Staff
a. Responsibilities
All instructional staff members are responsible for the particular course or courses they teach. This includes responsibilities for providing an updated course outline on a regular basis, selecting textbooks and administering adequate testing. The clinical education site(s) must have adequate clinical instructors responsible for evaluating the clinical competencies of students and maintaining appropriate records to verify that these competencies have been ably demonstrated.
b. Qualifications
The instructors must be knowledgeable and effective in teaching the subjects assigned.

All faculty members, regardless of the extent of their participation, should be familiar with the goals of the program and should be able to demonstrate the ability to develop an organized plan of instruction and evaluation.

Important criteria for employment of faculty should include: a) knowledge of subject matter, b) ability to organize and present the subject, c) positive attitude toward teaching and d) participation in continuing education designed to improve instructional skills and maintain professional competence.

3. Professional Development
Programs shall encourage continuing education in cardiac and vascular technology developments and continuing professional growth to ensure that program faculty and officials can fulfill the responsibilities delineated in the Essentials.

C. Financial Resources
Financial resources shall be assured to fulfill obligations to enrolled students.

The budget should reflect sound educational priorities with a high priority assigned to the improvement of the educational process.

D. Physical Resources
1. Facilities
Adequate classrooms, laboratories, administrative offices and other facilities shall be provided.
2. Equipment and Supplies
Equipment, accurately calibrated and in good working order and meeting applicable national and state standards, if any, must be available for the full range of diagnostic procedures for which the program is seeking accreditation. Appropriate multimedia materials and other instructional aids, including clinical and reference materials, must be available.

Clinical sites should have state-of-the-art equipment available to students during their clinical rotations. The clinical sites may be used to augment the diagnostic equipment found at the site of the sponsoring institution.

3. Library
Students shall have ready access to an adequate supply of up-to-date books, periodicals, journals, and other reference materials related to the curriculum.

The library maintained by the sponsoring institution should own enough printed and other media holdings to accommodate required study, promote independent study and research and to aid faculty in delivering and improving the program. Clinical affiliates should allow students access to reference materials for support of their clinical assignments. The faculty should be encouraged to participate in the selection of library materials. A list of holdings at both the educational institution and at the clinical education sites should be available to students and staff.

IV. CURRICULUM

A. Cardiovascular technology is a multidisciplinary science requiring the student to be suitably trained and educated in the basic and applied principles of several diagnostic and/or therapeutic modalities. Upon completion of an educational program, each student must have acquired clinical skills and knowledge consistent with specific clinical performance objectives in one or more of the following areas of expertise: Invasive Cardiology, Noninvasive Cardiology and Noninvasive Peripheral Vascular Studies.

B. Instruction must follow a plan which documents a structured curriculum, including clinical education, with clearly written course syllabi which adequately describe learning objectives and competencies to be achieved.

C. There shall be didactic courses and structured clinical experiences.

D. There shall be sufficient laboratory courses to familiarize all students with basic technologic equipment and procedures appropriate to the clinical specialty prior to entry into the clinical phase of the program.

E. Curriculum Length
1. For the high school graduate without previous postsecondary education, the course of study shall normally span a period of 24 months and consist of one year of core courses followed by a year of instruction for each area of specialization.
2. For the individual previously qualified in a clinically related allied health profession and meeting the curriculum course requirements, the professional curriculum shall normally be one calendar year in length for each area of specialization. These programs shall be conducted within a hospital environment or a combination of academic and clinical settings.

F. The curriculum must be comprised of at least the three major areas of:
1. Basic units of instruction
2. Cardiac and vascular units of instruction
3. Clinical instruction

Basic Units of Instruction

Suggested areas of instruction should combine both didactic instruction and structured laboratory experiences. The students should acquire a clear understanding of the basic sciences and how basic scientific principles relate to clinical applications in the cardiovascular technology field.

Suggested areas of instruction in the core curriculum:

- *Introduction to the Field of Cardiovascular Technology-including patient care techniques and the hospital environment*
- *General and/or Applied Sciences-including biology, basic chemistry, physical principles of medicine, basic statistics and general mathematics at a level approaching that of intermediate algebra*
- *Human Anatomy and Physiology-with emphasis on cardiac and vascular systems*
- *Basic Pharmacology-pertaining to cardiovascular drugs*
- *Basic Medical Electronics and Medical Instrumentation*

Related subjects may be selected from courses or course components in health care and general science that would meet established program objectives and goals and could enhance the professional ability of the cardiovascular technologist. These might include courses in reading comprehension, technical writing, research techniques, microbiology, interpersonal relationships, speech, and a foreign language.

Students who have mastered the basic areas of instruction may be brought to a higher level of understanding and confidence with a mixture of the required physiology, and electrical, physical, and clinical principles involved in the cardiovascular field. An opportunity should be provided to obtain the necessary level of knowledge and skills to properly operate and become thoroughly familiar with diagnostic and physiological instrumentation used in their particular clinical area of specialization.

Cardiac and Vascular Units of Instruction

The cardiac units of instruction include two major areas, invasive and noninvasive cardiology. The vascular units of instruction include subject matter relating to noninvasive peripheral vascular studies.

Clinical Instruction

The clinical units of instruction should include:

- *Cardiac and Vascular Pathophysiology*
- *Patient History & Physical Examination*
- *Patient Psychology, Care and Communications*
- *Cardiopulmonary Resuscitation*
- *Therapeutic Measures*
- *Clinical Cardiac and Vascular Medicine*
- *Statistics, Management of Data*
- *Physics*
- *Medical-Legal Ethics*

G. The curriculum shall be sufficient to provide:
   1. Knowledge of the technical skills necessary to perform appropriate diagnostic cardiac or vascular testing;
   2. An understanding of other diagnostic and interventional procedures as they relate to the clinical evaluation and treatment of cardiovascular disease;
   3. Comprehension of the methodologies required to obtain correct data pertinent to the diagnostic procedures being performed;
   4. An understanding of pertinent pharmacological effects that affect the cardiovascular status; and
   5. A knowledge of the attendant risks to the patient of any of the procedures performed.

H. Areas of study for each of the three areas of diagnostic evaluation are listed below. Normally students will be educated and trained to become proficient in only one of these areas in any given 12 month period.
   1. Invasive Cardiology
      Recording and performing preliminary analysis of invasive cardiovascular data in procedures such as:
      a. Measuring cardiovascular parameters such as cardiac output, blood flow and velocity, cardiopulmonary hemodynamics, cardiac electrophysiology, shunts, valve areas, and heartsounds with appropriate diagnostic procedures.
      b. Conducting quantitative and qualitative analysis of arterial and venous blood gases.
      c. Preparing, calibrating and operating monitoring instrumentation utilized for determining the presence and extent of cardiovascular abnormalities in diagnostic laboratory or operating room settings.
      d. Collecting and preparing diagnostic test data for review by a physician.
   2. Noninvasive Cardiology
      Recording and performing preliminary analysis of noninvasive cardiovascular data in procedures such as:
      a. Echocardiography (M-Mode, Two-Dimensional, and Doppler Studies)
         This component shall be approximately one year in length during the usual two year curriculum.

In a two year curriculum, echocardiography, along with the other noninvasive modalities listed, should be introduced during the students' first year. More detailed and specialized instruction in all the noninvasive modalities should be continued throughout the entire second year of the curriculum.

      b. Other noninvasive modalities including vectorcardiography, electrocardiography, exercise stress testing, ambulatory monitoring (Holter), phonocardiography, external pulse tracings and apexcardiography.
   3. Noninvasive Peripheral Vascular Study
      Recording and performing preliminary analysis of noninvasive peripheral vascular data in procedures such as:
      a. The use of quantitative and qualitative methods of assessing arterial obstruction in the upper and lower extremities including the use of Doppler ultrasound, pneumoplethysmographic tracings, segmental pressure measurement, photoplethysmographic and strain gauge plethysmographic assessment of digits.
      b. Quantitative and qualitative methods of detecting venous obstruction, venous reflux including use of Doppler ultrasound, impedance outflow plethysmography (electrical, strain gauge and pneumoplethysmographic), and photoplethysmography (for reflux).
      c. Quantitative and qualitative methods of determining the presence of cerebrovascular disease including Doppler ultrasound of periorbital arterial signals, ocular-plethysmography, carotid phonoangiography, continuous and pulsed Doppler ultrasound for audible assessment of the carotid artery, sound spectrum analysis of continuous and pulsed waveforms, A-mode imaging, and B-mode imaging.

The cardiovascular technologist is trained to perform the aforementioned tasks in various patient care settings. Each technologist is also trained in life support techniques.

1. Clinical Practicum
   1. Clinical instruction must be well planned and documented. Students must be exposed to, and gain experience in, the use of a wide variety of diagnostic and monitoring instrumentation.
   2. The program must ensure the student's mastery of the theory and practice of essential skills prior to the student's assuming clinical responsibilities.
   3. Any external rotation of students in clinical sites must be carefully monitored. The program sponsor shall be able to demonstrate that the students are not essential to carry out the normal workload in the clinical setting.
   4. Classroom presentations, discussion and demonstrations shall be utilized for effective didactic sessions.
   5. Supervised experience and student demonstration of skills required in obtaining diagnostic data shall be included in the curriculum.
   6. Evaluation of students to assess cognitive learning, problem solving skills, interpersonal skills, motor skills and clinical competencies shall be an on-going process throughout the program.
   7. Competencies required for successful completion of the program shall be clearly delineated. The clinical education site must have clinical instructors who are responsible for evaluating the clinical competencies of students and for maintaining appropriate records verifying that the competencies have been satisfactorily demonstrated.
   8. In the clinical setting 1) the student must be aware of the fact that the physician in charge has the ultimate authority and responsibility. 2) The student must be clearly identified as a student at all times. 3) Students must not take the responsibility, nor the place of, qualified staff. Students shall be permitted to perform procedures only under supervision.

V. STUDENTS

A. Information

Students shall be provided with a clear description of the field of cardiovascular technology with its occupational hazards and of the program and its content, including learning goals, course objectives, required competencies and supervised clinical education requirements.

Students should receive a description of the length of the program, the course material to be covered, and a description of the evaluation process prior to entry into the program. Individual course outlines defining course objectives, the schedule for courses, testing mechanisms, laboratory fees (if any) and the grading methods should be provided prior to the start of each course. Students should be informed of the clinical training that is available and the types of clinical training that they may pursue. Information regarding the length of the clinical practicum phase of their program, the types of hospitals or clinics that will be involved in such clinical practicum, the benefits deriving from such experience and training and the relationships between the didactic and the clinical training should all be explained to the students in an early phase of the program. Information regarding competency tests to be performed in the clinical area should be made available to each student prior to the beginning of a particular clinical course or phase of the program. Students should be informed about appropriate safety procedures to be followed throughout the course of study and the reasons for them.

B. Admission

Admission of students, including advanced placement, shall be made in accordance with the clearly defined and published practices of the institution. Any specific academic and technical standards required for admission to the program shall also be clearly defined and published.

Admissions criteria covering the selection of students should be periodically reviewed and validated, based on student outcomes reflected in evaluations of current students and follow-up studies of graduates. The program may choose to have an admissions committee. Selection criteria should be evaluated periodically to determine what effect they have had on student performance or attrition.

C. Evaluation

Criteria for successful completion of each segment of the curriculum and for graduation shall be given in advance to each student. Evaluation systems shall include content related to the objectives and competencies described in the curriculum for both didactic and supervised clinical education components. These shall be employed to provide both students and program officials with indications of the students' academic standings and progress.

The evaluation system for all phases of the program should be related to the educational objectives and be employed with such frequency so as to provide ongoing and terminal evaluations. The evaluation process should serve as a reliable indicator of the effectiveness of instruction and course design. The criteria for successful performance should be equitably applied without discrimination and provision should be made for remedial programs or dismissal after due process for students who do not make satisfactory academic progress according to these criteria. A standardized objective system to evaluate and document the students' clinical progress should be utilized in order to provide developmental assistance to correct weaknesses. Students should demonstrate to qualified supervisors their competence in carrying out appropriate assignments. Clinical records should provide baseline data for a competency-based clinical education evaluation system. They should therefore identify the required competency, the experiences undertaken to achieve the competency, evaluations by qualified personnel of the achievement of the competency and progression of the students in achieving proficiency.

D. Health

The program officials shall be responsible for determining that the applicants' or students' health will permit them to meet the written technical standards of the program. Students must be informed of and have access to the usual student health care services of the institution, including emergency health services and psychological counseling services where available. While it is not the intent that students be trained to expose patients to ionizing radiation, students must be protected against and monitored for exposure to ionizing radiation during their clinical rotations in cardiac catheterization or cardiovascular nuclear studies laboratories.

It should be of major concern that every program provide health care or develop some mechanism for students to obtain adequate health care insurance at reasonable group rates.

E. Guidance

Student guidance shall be available, to include assisting students in understanding and abiding by program policies and practices and providing counseling or referral for students with personal problems that may interfere with their progress in the program.

Programs should have student guidance procedures that include documentation of regular and timely discussion with qualified faculty of student strengths, weaknesses, and progress in the program; and providing evidence that students are informed of fair practices/due process with regard to admission/retention policies, unfavorable evaluations, and dis-

ciplinary policies such as those for suspension and dismissal.

VI. OPERATIONAL POLICIES

A. Fair Practices

1. Announcements and advertising must accurately reflect the program offered.

Student recruitment practices should permit students to exercise free choice of program.

Student recruitment practices should not be misrepresentative.

Misleading advertising concerning job placement should be avoided. The students should be informed of the employment opportunities that may be available upon graduation. The program should make available information relating to the program. This material should indicate the availability of the following items:

- *Certification information*
- *Vacation and compensatory time policies*
- *Standards of conduct and performance*
- *Disciplinary policies and procedures*
- *Policy regarding leaves of absence*

2. Student recruitment and admission practices and student and faculty recruitment and employment shall be nondiscriminatory with respect to race, color, creed, sex, age, handicaps or national origin.

Reasonable accommodation should be provided to handicapped applicants within the obvious limitations that the cardiovascular technology field imposes.

3. Academic credit and cost to the student shall be accurately stated and published.
4. Policies and processes for student withdrawal and refunds of tuition and other fees shall be published and made known to all applicants.

Tuition and fees should be consistent with institutional policies; if credit hours are the basis for tuition, the number of credits required in the program should be consistent with the degree granted.

Financial arrangements should be fair to the students and to the schools

- *Student loan programs or contracts should be explained in program publications.*
- *Grant procedures and policies should be published and made known to the student applicant.*

5. Policies and processes by which students may perform service work while enrolled in the program must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. Students may be employed in the field of study outside regular educational hours provided the work is limited so that it does not interfere with regular academic responsibilities. The work must be noncompulsory, paid, and subject to employee regulations.

B. Student Records

Satisfactory records shall be maintained for student admission, attendance, participation, and evaluation. Grades and credits for courses shall be recorded on the student transcript and permanently maintained by the sponsoring institution.

Provision should be made for permanent retention of student transcripts in the event that the program and/or sponsoring institution should discontinue operations.

VII. PROGRAM EVALUATION

A. The program must have a continuing system for periodically and systematically reviewing the effectiveness of the program, including a formal self-study and the Self-Study Report required by the accreditation review process.

B. The results of program evaluation must be appropriately reflected in review of the curriculum and other elements of the program with appropriate revision.

Program evaluation should include a continuing system for internal and external curriculum validation, including evaluation by current and former students; follow-up studies of alumni, such as employment and examination performance; and input from advisory groups, such as admission, curriculum, and advisory committees.

VIII. MAINTAINING AND ADMINISTERING ACCREDITATION

A. Program/Sponsoring Institution Responsibilities

1. Applying for Accreditation

The accreditation review process conducted by the Committee on Allied Health Education and Accreditation (CAHEA) can be initiated only at the written request of the chief executive officer or an officially designated representative of the sponsoring institution.

This process is initiated by requesting an application form from and returning it to:

Division of Allied Health Education and Accreditation
American Medical Association
535 N Dearborn St
Chicago IL 60610

A program or sponsoring institution may at any time prior to the final accreditation action withdraw its request for initial or continuing accreditation.

2. Maintaining Accreditation

Programs are required to comply with administrative requirements for maintaining accreditation, which include:

a. Submitting the Self-Study Report or a required progress report within a reasonable period of time, as determined by the review committee.
b. Agreeing to a reasonable site visit date before the end of the period for which accreditation was awarded.
c. Informing the review committee within a reasonable period of time when new program personnel required by the Essentials are appointed.
d. Paying review committee fees within a reasonable period of time, as determined by the review committee.
e. Completing and returning by the established deadline the Annual Report provided by CAHEA.

Failure to meet these administrative requirements for maintaining accreditation may lead to being placed on Administrative Probation and ultimately to having accreditation withdrawn.

B. CAHEA/Review Committee Responsibilities

1. Administering the Accreditation Review Process

At the written request of the chief executive officer or an officially designated representative, the Committee on Allied Health Education and Accreditation and the Joint Review Committee will review educational programs to assess compliance with the Essentials.

The accreditation review process includes a site visit. If the performance of a site visit team is unacceptable, the institution may request a second site visit.

Before the review committee forwards its recommendation to CAHEA, the program being reviewed is given an opppor.unity to review the findings and conclusions of the site visit team and to comment on their accuracy.

Prior to recommending Probationary Accreditation to CAHEA, the review committee provides the sponsoring institution with a second opportunity to respond to the cited deficiencies. Review committee reconsideration of a recommendation for Probationary Accreditation will be made only on the basis of conditions existing when the review committee arrived at its accreditation recommendation to CAHEA and on subsequent documented evidence of corrected deficiencies.

CAHEA assignments of Probationary Accreditation, including those following review committee reconsideration, are final and are not eligible for further appeal.

2. Withholding or Withdrawing Accreditation
Prior to recommending Accreditation Withheld or Accreditation Withdrawn to CAHEA, the review committee will provide the sponsoring institution with an opportunity to request reconsideration by the review committee. CAHEA decisions to withhold or withdraw accreditation are final unless appealed to CAHEA. A copy of the CAHEA Appeals Procedures for Accreditation Withheld or Withdrawn is included in the letter notifying the program of one of these actions.

When accreditation is withdrawn, the appropriate official is provided with a clear statement of each deficiency and is informed that application for accreditation as a new applicant may be made whenever the program is believed to be in substantial compliance with the Essentials.

All students successfully completing a program granted any accreditation category at any point during their tenure as students are regarded as graduates of a CAHEA-accredited program.

3. Inactive Programs
Programs that do not enroll students for one or two years are designated as inactive. Such programs must continue to pay annual fees to the review committee. After being inactive for two years, the program will be considered as discontinued, and accreditation may be withdrawn.

APPENDIX B: Minutes of Advisory Committee Meeting

CARDIOVASCULAR TECHNOLOGY PROGRAM
ADVISORY COMMITTEE MEETING
JANUARY 9, 1991

MINUTES

PRESENT: *Pat Ghandi, Collene Kelly, Karen Kittle, Vicki Kloosterhouse, Kathy Krawecki, June Martin, Bev Morrison, Marty Orlowski, William Pinsky, Richard Saunders, Dee Scherer, Sarah Serra, Carolyn Skaff, Joan Simon, James Warner, Joseph Witherspoon, Fred Woolf*

ABSENT: *Sandy Callahan, Brad Connors, Diane Edwards, Kathy Houtakami, Theresa Wangler, Gary Willyerd*

The meeting began at 6 p.m. with dinner.

At 6:40 p.m. Dr. Saunders called the meeting to order. Dr. Saunders welcomed members of the Advisory Committee and asked everyone to introduce themselves.

D. Scherer then chaired the meeting. She also welcomed everyone and thanked them for taking their personal time to attend this meeting.

Dee mentioned the assistance and encouragement she has received from Dennis Carney, who is the NCT program director in Spokane, Washington. His program is one of the two CAHEA accredited programs in the country. Dee said OCC wished it could be #3 in the country but Dr. Pinsky said he thought another program more than likely is closer to that goal because they are ready for their On-Site-visit. Dee hopes OCC then is #1 in Michigan!

Dee outlined past events for the benefit of the committee. The first feasibility study was mailed last summer. The response was overwhelming as she received 82 responses. In the fall another survey was sent to cardiologists and administrators and that response was also very positive. 22 students provided Dee with their names and addresses this fall indicating they are interested in this program.

In October, all surveys and results were turned over to Marty Orlowski and June Martin as their expertise was required.

Marty Orlowski provided the members with a copy of a Need Assessment Survey that will be sent out from the Center for Institutional Research by the end of this month. Marty stated that he was pleased with the materials provided and he and June have compiled a wealth of additional information and are still gathering more pertinent information regarding cardiovascular technology.

Dee explained that the next step was for her to write the course material and requested assistance. Dr. Pinsky offered to assist Dee regarding the curriculum, and she thanked him for making his expertise available to her. Dee said she'd mail a corrected copy of the complete curriculum to Dr. Pinsky as soon as possible for his review and then all corrections will be made before presenting to the Campus Curriculum Committee in late January. Dr. Pinsky asked if this date could be delayed a few weeks and Dee said she'd contact the college curriculum chairperson to see if that is possible. The College Curriculum Committee is set for April, 1991.

The items in the packet were then explained as they pertain to the courses and program. It was suggested that changes be made regarding NCT 123, as to when in the program that course should be offered. It was also recommended to include anatomy and physiology, physics of sonography and chemistry but to delete First Aid (PER 254). Dee mentioned that some last minute changes in course numbers were not made in their hand-outs and she apologized to the members for this confusion.

Dr. Warner asked the committee if this is the correct place to be training people for this profession. Mr. Witherspoon and others said a definite "yes". He stated that the need for trained cardiovascular personnel is growing because the field of cardiology is expanding for good patient care. It was reported that there are only 100 registered Echocardiographers in the State and that is not sufficient. Bev Morrison stated that her employer had spent valuable time and a great deal of money to train a person and have her become a registered echocardiographer, only to have her leave the hospital shortly afterward. All members agreed that hospitals are practicing 'cost containment' and no longer offer such educational opportunities. Bev also suggested at this time that students could learn hands-on experience in the hospital, after hours. They would do tests on each other, thus eliminating any problems regarding malpractice.

Pat Gandi then offered the use of his facilities for training.

The committee stated that there was a need to be aware of costs of equipment and look to vendors for donations. Dee asked for any assistance regarding donations of equipment for this program.

The committee was asked if Macomb reinstituted their program would there be a need for OCC to do this one. The answer was "YES". If the proper things are done regarding PR and advertising, there should be no problem having enough students. The more graduates there are, the higher the wages will be, they agreed.

It was also suggested that the curriculum include a requirement for attending State CVT Seminars.

Dee explained that the next step was for her to write the course material and requested assistance. Dr. Pinsky offered to assist Dee regarding the curriculum, and she thanked him for making his expertise available to her. Dee said she'd mail a corrected copy of the complete curriculum to Dr. Pinsky as soon as possible for his review and then all corrections will be made before presenting to the Campus Curriculum Committee in late January. Dr. Pinsky asked if this date could be delayed a few weeks and Dee said she'd contact the college curriculum chairperson to see if that is possible. The College Curriculum Committee is set for April, 1991.

The items in the packet were then explained as they pertain to the courses and program. It was suggested that changes be made regarding NCT 123, as to when in the program that course should be offered. It was also recommended to include anatomy and physiology, physics of sonography and chemistry but to delete First Aid (PER 254). Dee mentioned that some last minute changes in course numbers were not made in their hand-outs and she apologized to the members for this confusion.

Dr. Warner asked the committee if this is the correct place to be training people for this profession. Mr. Witherspoon and others said a definite "yes". He stated that the need for trained cardiovascular personnel is growing because the field of cardiology is expanding for good patient care. It was reported that there are only 100 registered Echocardiographers in the State and that is not sufficient. Bev Morrison stated that her employer had spent valuable time and a great deal of money to train a person and have her become a registered echocardiographer, only to have her leave the hospital shortly afterward. All members agreed that hospitals are practicing 'cost containment' and no longer offer such educational opportunities. Bev also suggested at this time that students could learn hands-on experience in the hospital, after hours. They would do tests on each other, thus eliminating any problems regarding malpractice.

Pat Gandi then offered the use of his facilities for training.

The committee stated that there was a need to be aware of costs of equipment and look to vendors for donations. Dee asked for any assistance regarding donations of equipment for this program.

The committee was asked if Macomb reinstituted their program would there be a need for OCC to do this one. The answer was "YES". If the proper things are done regarding PR and advertising, there should be no problem having enough students. The more graduates there are, the higher the wages will be, they agreed.

It was also suggested that the curriculum include a requirement for attending State CVT Seminars.

APPENDIX C: Hospital Survey

OAKLAND COMMUNITY COLLEGE
CARDIOVASCULAR TECHNOLOGY PROGRAM
NEEDS ASSESSMENT SURVEY

INSTRUCTIONS: Please respond to each of the following questions based on your knowledge of the current and future status of Cardiovascular Technology in your hospital. When finished, place the completed survey in the self-addressed, postage-paid envelop (provided) and drop it in the mail today. Thank you.

1. How many Cardiovascular Technologists does your hospital employ currently in the following areas?

	Invasive	Non-Invasive
Full-Time	_____	_____
Part-Time	_____	_____

2. How many Cardiovascular Technologists do you anticipate employing in:

   1995 _____ 2000 _____

   Reasons for the increase/decrease:_____

   _____

   _____

3. How many Cardiovascular Technologists will need to be replaced because of retirement, attrition, etc. by:

   1995 _____ 2000 _____

4. How many "new" Cardiovascular Technologists will you hire in:

   1992 _____ 1993 _____

5. What percent of Cardiovascular Technologists that your hospital employs will need retraining or upgrading of their skills on an annual basis?

   _____ Percent of current Cardiovascular Technologists

6. What is the annual salary range that your hospital offers to (registered and non-registered) Cardiovascular Technologists?

Entry level (not registered)	$_____	to $_____
Entry level (registered):	$_____	to $_____
Upper level (not registered)	$_____	to $_____
Upper level (registered):	$_____	to $_____

BEST COPY AVAILABLE

8. Why would the position of Cardiovascular Technologist be a desirable occupation? _____

_____

9. Are Cardiovascular Technology positions open to the disabled?

___Yes ___No

If not, what are the reasons:_____
_____

_____

10. Does your hospital make any special efforts in recruiting minorities as Cardiovascular Technologists?

___Yes ___No

11. What credentials (if any) are required by your hospital for Cardiovascular Technologists?

___No credentials required
___Cardiographic Technician (CCT)
___Registered Cardiovascular Technologist (Non-Invasive)
___Registered Cardiovascular Technologist (Invasive)
___Holter Monitoring
___Associates Degree in Cardiovascular Technology
___Other_____

12. What skills do you require of Cardiovascular Technologists?

Invasive:

____ Cardiac catheterization
____ Blood gas
____ Electrophysiology lab
____ Other _____
____ Other _____

Non-Invasive:

____ Echocardiography
____ Exercise stress testing
____ Electrocardiography laboratories
____ Doppler cardiac ultrasound
____ Other _____
____ Other _____

13. Is current available training for Cardiovascular Technologists adequate?

___Yes ___No

Explain:_____

_____

13. Is current available training for Cardiovascular Technologists adequate?

___Yes ___No

Explain:_____

_____

14. Please comment on the "need" for a Cardiovascular Technology program:_____

_____

_____

15. Do you have on-site training for Cardiovascular Technologists?

___Yes ___No

If yes, is the training designed to provide:

____Basic Cardiovascular Skills
____Upgrading of Cardiovascular skills

16. Would your hospital be willing to have Oakland Community College studentsdo on-site training for:

	Yes	No
Invasive Cardiovascular Technology	___	___
Non-Invasive Cardiovascular Technology	___	___

17a. Is your hospital associated with any "free-standing" clinics that hire Cardiovascular Technologists?

____Yes, If yes please answer 17b.
____No

17b. Name of clinic(s):

_____

_____

_____

In case that we may have a few follow-up questions after reviewing your responses, please provide your name and phone number where you can be contacted during normal office hours. Thank you.

Name: _____ Phone (_____)_____

The information you provided in this survey will help OCC determine the future of its Cardiovascular Technology program. Please place the completed survey in the self-addressed, postage-paid envelop (provided) and drop it in the mail today. Thank you.

OCC, Office of Institutional Research, 27055 Orchard Lake Rd. Farmington Hills, MI 48334.

APPENDIX D: List of Hospitals

Sources: NSCT/NSPT; American Hospital Association Resource Center; Marygrove College (Catalog listing of affiliations); and Oakland Community College at Highland Lakes (earlier survey)

Atallah Heart Center, P.C.
Rochester, MI

Annapolis Hospital
Wayne, MI

Beyer Hospital
Ypsilanti, MI

Bi-County Community Hospital
Warren, MI

Bon Secours Hospital
Grosse Pointe, MI

Botsford General Hospital
Farmington Hills, MI

Children's Hospital of Michigan
Detroit, MI

Cottage Hospital of Grosse Pointe
Grosse Pointe Farms, MI

Crittenton Hospital
Rochester, MI

Detroit-Macomb Hospital Corporation
Detroit, MI

Detroit Osteopathic Hospital
Highland Park, MI

Flint Osteopathic Hospital
Flint, MI

Garden City Osteopathic Hospital
Garden City, MI

Grace Hospital
Detroit, MI

Harper Hospital
Detroit, MI

Henry Ford Hospital/Heart and Vascular Institute
Detroit, MI

Holy Cross Hospital
Detroit, MI

Hutzel Hospital
Detroit, MI

Hurley Medical Center
Flint, MI

Huron Valley Hospital
Milford, MI

Lapeer Regional Hospital
Lapeer, MI

Macomb Hospital Center
Warren, MI

McLaren General Hospital
Flint, MI

McPherson Hospital
Howell, MI

Michigan Heart Institute
Ann Arbor, MI

Michigan Osteopathic Medical Center
Detroit, MI

Mt. Clemens General Hospital
Mt. Clemens, MI

North Detroit General Hospital
Detroit, MI

Oakland General Health Systems
Madison Heights, MI

Oakwood Hospital
Dearborn, MI

Pontiac General Hospital
Pontiac, MI

Pontiac Osteopathic Hospital
Pontiac, MI

Providence Hospital
Southfield, MI

Riverside Osteopathic Hospital
Trenton, MI

Saline Community Hospital
Saline, MI

Samaritan Health Center
Detroit, MI

Seaway Hospital
Trenton, MI

Sinai Hospital of Detroit
Detroit, MI

St. John Hospital and Medical Center
Detroit, MI

St. Joseph's Hospital Center-Clemens
Mount Clemens, MI

St. Joseph Hospital
Flint, MI

St. Joseph Mercy Hospital
Ann Arbor, MI

St. Joseph Mercy Hospital
Pontiac, MI

St. Mary Hospital
Livonia, MI

Southwest Detroit Hospital
Detroit, MI

University of Michigan Medical Center
Ann Arbor, MI

Vencor Detroit Hospital
Lincoln Park, MI

Veterans Administration Medical Center
Allen Park, MI

Veterans Administration Medical Center
Ann Arbor, MI

William Beaumont Hospital
Royal Oak, MI

William Beaumont Hospital
Troy, MI

Wyandotte General Hospital
Wyandotte, MI

APPENDIX E: College Program Survey

OAKLAND COMMUNITY COLLEGE
CARDIOVASCULAR TECHNOLOGY
TELEPHONE SURVEY

SURVEY OF CARDIOVASCULAR TECHNOLOGY DIRECTORS/RESEARCH DIRECTORS IN COLLEGES WHO HAVE CVT PROGRAMS.

Date_____ Interviewee_____

College_____

1. When was your Cardiovascular Technology program established? (When did students "first" enroll in courses)?

   Year: 19_____

2. How many students have enrolled in the Cardiovascular Technology program since the program was established?

Fall	Students	Invasive	Noninvasive
1990	_____	_____	_____
1989	_____	_____	_____
1988	_____	_____	_____
1987	_____	_____	_____
1986	_____	_____	_____

3. How many students have graduated from the Cardiovascular Technology program since the program was established?

Year	Graduates	Invasive	Noninvasive
89-90	_____	_____	_____
88-89	_____	_____	_____
87-88	_____	_____	_____
86-87	_____	_____	_____
85-86	_____	_____	_____

4. How many faculty taught courses in the Cardiovascular Technology program during the Fall of 1990?

   _____Full-Time
   _____Part-Time

5. What agency accredits or approves your Cardiovascular Technology program?

___Program is not accredited/approved
___CAHEA* accreditation (month/year_____)
___NSCT/NSPT* approval (month/year_____)
___In process of being accredited by CAHEA*
___In process of being approved by NSCT/NSPT*
___Other (explain)_____

6. What was the initial cost of establishing your Cardiovascular Technology program?

ESTIMATED EXPENSES

Full-Time instructors	$_____
Part-Time instructors	_____
Clinical facilities	_____
Supplies	_____
Equipment**	_____
Repair	_____
Supervisory expenses (travel)	_____
Continuing education conferences	_____
Ref. library of films, videotapes, print material	_____
Other_____	_____
Other_____	_____
TOTAL EXPENSES	$_____

**Description of donated/used equipment_____

_____

_____

*Note: CAHEA (Committee on Allied Health Education and Accreditation); NSCT/NSPT (National Society For Cardiovascular Technology/National Society for Pulmonary Technology)

APPENDIX F: List of Colleges

Programs in Cardiovascular Technology

Programs accredited by the American Medical Association:

Grossmont College 8800 Grossmont College Drive
El Cajon, CA 92020
Contact: Rick Kirby, Cardiovascular Program Director
619 465-1700

Spokane Community College
No. 1810 Greene Street
Spokane, Washington 90297
Contact: Wes Todd and Dennis Carney
509 536-7000

Programs approved by NSCT/NSPT:

Gwenedd-Mercy College
Allied Health
Sumneytown Pike
Gwynedd Valley, Pennsylvania
19437
Contact: Andrea Reiley-Helzner
(215) 646-7300

State University of New York at Stony Brook
Allied Health
SAHP;HSC;2L052
SUNY at Stony Brook
Stony Brook, New York 11794
Contact: William Treanor
(516) 689-6000; (516) 444-2250

REFERENCES

Allied Health Education Fact Sheet, AMA/Division of Allied Health Education and Accreditation, April 1990, 1-8.

Allied Health Education Newsletter, AMA/Division of Allied Health Education and Accreditation, 21,(6), November/December 1990.

Carney, Dennis K. Cardiac sonographer's communication: Status of cardiovascular education. Journal of the American Society of Echocardiography, November-December 1988,1,(6), 466-469.

Dictionary of Occupational Titles (D.O.T.), Fourth Edition Supplement, 1986.

Directory of Certified/Registered Cardiovascular Professionals (CCI/NBCVT); 1990 Annual Directory.

Gallaher-Loya, Kathleen. JRC-CVT, 1990. CP Digest, September/October 1990, 2,(5), 3.

Essentials and Guidelines of an Accredited Educational Program for the Cardiovascular Technologist, Committee on Allied Health Education and Accreditation (CAHEA), 1985. 1-7.

Occupational Outlook Handbook,(1988-89 Edition). U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2300 April 1988, 165-167.

Reiling, Edmund C., Parrish, Rebecca S., and Fogel, Norman. Cardiovascular technologist task analysis. Research Brief: Allied Health Manpower Data Initiative, CCI/NBCTV, 1990, 1-3.

Organizations

Cardiovascular Credentialing International-National
Board of Cardiovascular Technology
2801 Far Hills; P.O. Box 611
Dayton, Ohio 45419
Parrish, Becky, Administrative Publications Coordinator
513 268-0268; 513 293-0315

Hewlett-Packard Company
39550 Orchard Hill Place Drive; P.O. Box 8024
Novi, MI 48376
Ted Paddock
313 349-9200

Michigan Employment Security Commission (MESC)
Occupational Research Section
7310 Woodward Avenue, Room 422
Detroit, MI 48202
Kenneth Parker
313 471-7544; 876-5300

Michigan Occupational Information System (MOIS)
Department of Education
Lansing, MI
Dunham, Gail
313 335-0383

NSCT/NSPT National Office
1101 14th Street, NW; Suite 1100
Washington, DC 20005
McElgunn, Peggy and Nagle, Meggin
202 371-1267

ERIC Clearinghouse for
Junior Colleges

JUL 17 1992